Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1 to 20 (canceled)

Claim 21 (currently amended): An apparatus for monitoring selected trace constituents in exhaust gases, the apparatus comprising:

(a) a diode laser tuneable over a range of frequencies for generating a laser beam, the diode laser located remotely from the exhaust gases;

~~(b) control means to control the frequency of the laser to scan rapidly across an absorption range encompassing an absorption line of a selected trace constituent of interest;~~

~~(c)~~(b) transmission means, remote from the diode laser and connected to the laser by optical fiber connection means, the transmission means to transmit the laser beam through the exhaust gas;

~~(d)~~(c) detection means for detecting the laser beam after transmission through the exhaust gas; ~~and~~

(d) control means to control the frequency of the laser to scan repeatedly and rapidly across an absorption range encompassing an absorption line of a selected trace constituent of interest, the control means having:

(i) a two-tone generator to generate a frequency signal and to output said signal as a two-tone frequency modulated signal and as a separate signal representing the original frequency signal;

(ii) a laser control unit to receive the two-tone frequency modulated signal from the two-tone generator, the laser control unit having a ramp generator to control the laser driver current so that the frequency of the laser scans repeatedly and rapidly across the absorption range of

interest, the laser control unit superimposing the two-tone frequency modulated signal onto the laser driver current to generate with the diode laser the laser beam for transmission;

(iii) demodulating means to receive the detected laser beam and output a demodulated signal; and

(iv) a mixer means for receiving from the demodulating means the demodulated signal, and receiving from the two-tone generator the signal representing the original frequency signal, the mixer producing a DC output signal proportional to the detected differences between the demodulated signal and the signal representing the original frequency signal; and

(e) processing means for providing the concentration of the selected trace constituent based upon the DC output signal~~by comparing the detected laser beam to the transmitted laser beam~~.

Claims 22–23 (canceled)

Claim 24 (currently amended): An apparatus as claimed in claim [[23]] 21 wherein the ramp generator has a frequency in the range of 10–100 kHz.

Claim 25 (currently amended): An apparatus as claimed in claim 21 wherein the control means comprises a mixer to create [[a]] the two-tone frequency modulated signal ~~laser beam~~.

Claim 26 (currently amended): Apparatus according to claim 21 ~~further comprising an~~ wherein optical fiber connection means provides ~~providing~~ a connection between the laser and the transmission means and provides ~~providing~~ a connection between the detection means and the control ~~processing~~ means.

Claim 27 (currently amended): An apparatus as claimed in claim 26 wherein the optical fiber connection means comprises an optical fiber connecting the laser to the

transmission means, and connecting the detection means to the control ~~processing~~ means for transmission of a returned beam.

Claim 28 (previously presented): An apparatus as claimed in claim 27 wherein the optical fiber is a single mode fiber.

Claim 29 (currently amended): An apparatus as claimed in claim 28 further comprising a beam splitter and combiner means connected between the laser and the optical fiber, the beam splitter and combiner means also being connected to the control ~~processing~~ means.

Claim 30 (previously presented): An apparatus as claimed in claim 29 further comprising a reference cell connected to the beam splitter and combiner means for receiving part of the radiation from the laser, for reference purposes.

Claim 31 (previously presented): An apparatus as claimed in claim 30 comprising a plurality of lasers, and, for each laser, a respective beam splitter and combiner means connected thereto and a reference cell and a detector both connected to the beam splitter and combiner means, and wherein the apparatus includes a first multiplexer means having a plurality of connections on one side, each connected to one of the beam splitters and combiner means, and a connection on the other side to the transmission means and the detection means.

Claim 32 (previously presented): An apparatus as claimed in claim 31 further comprising a second multiplexer means having an input connected to the other side of the first multiplexer means, and a plurality of outputs and wherein the apparatus includes a plurality of pairs of transmission means and receiving means, each pair of transmission and receiving means being connected to one output of the second multiplexer means.

Claim 33 (previously presented): An apparatus as claimed in claim 26 further comprising at least one of: (a) multiplexer means and a plurality of pairs of transmission means and detection means, the multiplexer means providing a connection between the optical fiber connection means and the pairs of transmission and detection means for selective connection to one pair thereof, and (b) a plurality of lasers and beam splitter and combiner means connecting the lasers to the optical fiber connection means for simultaneous transmission and reception of at least two different laser beams.

Claim 34 (currently amended): An apparatus as claimed in claim 26 wherein the optical fiber transmission means comprises a first optical fiber connecting the laser to the optical transmission means, and a second optical fiber transmitting a returned beam from the detection means to the control ~~processing~~ means, wherein the apparatus includes a plurality of pairs of optical transmission means and detection means, wherein each of the first and second optical fibers comprises a first portion and a plurality of second portions, wherein the apparatus further includes a first optical multiplexer having an input connected to the first portion of the first optical fiber, the other end of which is connected to the laser, wherein the plurality of second portions of the first optical fiber provide connections between the first multiplexer and the optical transmission means, wherein a second multiplexer has an output connected to the first portion of the second optical fiber, the other end of which is connected to the detection means, and wherein the plurality of second portions of the second optical fiber provide connections between the second multiplexer and the detection means, the first and second multiplexers being operable to connected a selected pair of the transmission means and the receiving means to the laser and the detection means.

Claim 35 (previously presented): An apparatus as claimed in claim 32 comprising a plurality of lasers, and beam splitter and combiner means for combining the outputs from the lasers for communication through the first optical fiber and wherein each laser has an associated beam splitter and combiner means to which its output is connected, each of which beam splitter and combiner means has one output providing a connection to the first optical fiber and another output connected to a reference cell.

Claim 36 (currently amended): An apparatus as claimed in claim 26 wherein the detection means is separate from the optical transmission means, for mounting on either side of an area through which the trace constituents to be analyzed passes, and wherein the optical fiber connection means comprises a first transmission optical fiber connecting the laser to the optical transmission means, and a second return optical fiber transmitting a returned beam from the detection means to the control ~~processing~~ means.

Claim 37 (previously presented): An apparatus as claimed in claim 34 wherein the transmission means and the receiving means comprise a point source monitor, including a multipass sample cell, providing an extended analytical path and wherein the optical fiber connection means comprises a first, transmission optical fiber connecting the laser to the optical transmission means, and a second, return optical fiber transmitting a returned beam from the receiving means to the detector means.

Claim 38 (currently amended): An apparatus for the remote detection of selected trace constituents in flue gases, in use with an installation comprising at least one stack for discharging flue gases to the atmosphere and at least one building providing an enclosed area, the apparatus comprising:

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(a) a diode laser tuneable over a range of frequencies for generating a laser beam, the diode laser located remotely from the exhaust gases;

~~(b) control means to control the frequency of the laser to rapidly scan across an absorption range encompassing an absorption line of a selected trace constituent of interest;~~

~~(c)~~(b) transmission means, remote from the diode laser and connected to the laser by optical fiber connection means, the transmission means to transmit the laser beam through the flue gas;

~~(d)~~(c) detection means for detecting the laser beam after transmission through the flue gas;

(d) control means to control the frequency of the laser to scan repeatedly and rapidly across an absorption range encompassing an absorption line of a selected trace constituent of interest, the control means having:

(i) a two-tone generator to generate a frequency signal and to output said signal as a two-tone frequency modulated signal and as a separate signal representing the original frequency signal;

(ii) a laser control unit to receive the two-tone frequency modulated signal from the two-tone generator, the laser control unit having a ramp generator to control the laser driver current so that the frequency of the laser scans repeatedly and rapidly across the absorption range of interest, the laser control unit superimposing the two-tone frequency modulated signal onto the laser driver current to generate with the diode laser the laser beam for transmission;

(iii) demodulating means to receive the detected laser beam and output a demodulated signal; and

(iv) a mixer means for receiving from the demodulating means the demodulated signal, and receiving from the two-tone generator the signal representing the original frequency signal, the mixer producing a DC output signal proportional to the detected differences between the demodulated signal and the signal representing the original frequency signal;

(e) processing means for providing the concentration of the selected trace constituent based upon the DC output signal~~by comparing the detected laser beam to the transmitted laser beam~~;

(f) a multiplexer means providing a connection between the laser and the transmission means and between the detection means and the processing means; and

(g) an optical fiber connection means providing a connection between a laser and the optical transmission means and between the detection means and the processing means;

and wherein the transmission means and the detection means are mounted to one stack adjacent the top thereof, ~~whereby~~ so that a laser beam is transmitted

through the flue gases discharged in the stack, and wherein the laser, the detection means and the multiplexer means are located in the enclosed area of the building, ~~whereby~~ so that the laser, the detection means and the multiplexer means are protected by the building, the pairs of optical transmission means and detection means are remote from the laser and the detection means and are connected thereto by the optical fiber connection means, and the multiplexer means can selectively connect the laser to any one pair of the optical transmission means and the detector means.

Claim 39 (previously presented): An apparatus as claimed in claim 38 comprising a plurality of lasers, and wherein a beam splitter and combiner means is connected to the lasers, wherein each laser has a respective reference cell connected to the beam splitter and combiner means for receiving a portion of the radiation thereof for reference purposes, and wherein a detector is provided for each laser, connected to the beam splitter and combiner means for receiving a portion of the radiation returned back to the detector.

Claim 40 (previously presented): An apparatus as claimed in claim 39 that includes a plurality of lasers and beam splitter and combiner means providing a connection between the lasers and the multiplexer means.

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Claim 41 (previously presented): An apparatus as claimed in claim 40 wherein the beam splitter and combiner means provides an output for a reference signal from each laser and includes reference cell means connected to the output of the beam splitter and combiner means.

Claim 42 (previously presented): An apparatus as claimed in claim 41 wherein the beam splitter and combiner means receives the returned laser beam and includes a further output connection connected to the detection means.

Claim 43 (previously presented): An apparatus as claimed in claim 42 wherein the multiplexer means has a first multiplexer having a plurality of connections on one side,

connected to the transmission means and the detection means, and having a first pair of connection ports on the other side, and a second multiplexer comprising a plurality of connections on one side connected to the lasers and the detection means, and a second pair of connection ports on the other side connected to the first pair of connection ports of the first multiplexer.

Claim 44 (previously presented): An apparatus as claimed in claim 38 wherein the multiplexer means has a plurality of connections on one side connected to the transmission means and the detection means and a connection port on the other side thereof, and wherein the apparatus includes a plurality of beam splitter and combiner means which are connected together to form a single connection connected to the connection port of the multiplexer means and which are connected to the lasers and to the detection means, whereby each laser beam is connected through to the multiplexer means and a return beam is connected through to the detection means, and wherein the beam splitter and combiner means provide outputs for reference signals from the lasers, the apparatus including reference cell means connected to said outputs.

Claim 45 (currently amended): A method of monitoring selected trace constituents in exhaust gases, the method comprising:

(a) transmitting a diode laser beam tuneable over a range of frequencies through the exhaust gas, the diode laser located remotely from the exhaust gases;

(b) controlling the frequency of the laser to scan repeatedly and rapidly across an absorption range encompassing an absorption line of a selected trace constituent of interest, the control means having a two-tone generator to generate a frequency signal and to output said signal as a two-tone frequency modulated signal and as a separate signal representing the original frequency signal, and a laser control unit to receive the two-tone frequency modulated signal from the two-tone generator, the laser control unit having a ramp generator to control the laser driver current so that the frequency of the laser scans repeatedly and rapidly across the absorption range of interest, the laser control unit superimposing the two-tone frequency modulated signal onto the laser driver current to generate with the diode laser the laser beam for transmission;

(c) detecting the transmitted laser beam after transmission of the beam through the exhaust gas, the control means further having demodulating means to receive the detected laser beam and output a demodulated signal, and a mixer means for receiving from the demodulating means the demodulated signal, and receiving from the two-tone generator the signal representing the original frequency signal, the mixer producing a DC output signal proportional to the detected differences between the demodulated signal and the signal representing the original frequency signal; and

(e) determining the concentration of the selected trace constituent based upon the DC output signal~~by comparing the detected laser beam to the transmitted laser beam~~.

Claim 46 (previously presented): A method according to claim 45 wherein the laser beam is transmitted across a road for monitoring exhaust plumes from a vehicle.

Claim 47 (previously presented): A method according to claim 45 wherein the laser beam is transmitted through a flue gas discharged from a stack.

Claim 48 (previously presented): A method according to claim 45 wherein the laser beam is transmitted through a flue gas inside a stack.

C1 Claims 49–50 (canceled)

Claim 51 (currently amended): A method according to claim [[50]] 45 wherein the ramp generator has a frequency in the range of 10–100 kHz.

Claim 52 (currently amended): A method according to claim 45 wherein a mixer is provided to create a two-tone frequency modulated signal ~~laser beam~~.